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EMC-99-026CON1


IN THE UNITED STATES PATENT AND TRADEMARK OFFICE BEFORE THE BOARD
OF PATENT APPEALS AND INTERFERENCES

APPEAL BRIEF ON BEHALF OF PRESTON CROW, ET AL.
PURSUANT TO 37 C.F.R. 41.31

APPLICANT:	Preston Crow, <i>et al.</i>	GROUP ART UNIT:	2162
U.S.S.N.:	10/644,458	CUSTOMER NO.	24227
FILING DATE:	August 20, 2003	EXAMINER:	Ly, Anh
TITLE:	VERSATILE INDIRECTION IN AN EXTENT BASED FILE SYSTEM		

CERTIFICATE OF FACSIMILE UNDER 37 C.F.R. §1.8(a)

The undersigned hereby certifies that this document has been transmitted by facsimile on January 7, 2008 to the
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APPEAL BRIEF

This is an Appeal Brief in connection with an Appeal from a final rejection decision of the
Primary Examiner dated April 6, 2007 in the above-identified application and pursuant to a Notice of
Appeal filed on September 6, 2007. This Appeal Brief is being filed with a Petition for a Two Month
Extension of Time pursuant to 37 C.F.R. 41.31 and 37 CFR 1.136.

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I. REAL PARTY IN INTEREST

The real party in interest is EMC Corporation, the assignee of record.

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II. RELATED APPEALS AND INTERFERENCES

None.

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III. STATUS OF CLAIMS

Claims 1, 2, 4-6, 13, 14 and 16 are on appeal.

Claim 1 is rejected.

Claim 2 is rejected.

Claim 3 is canceled.

Claim 4 is rejected.

Claim 5 is rejected.

Claim 6 is rejected .

Claim 7 is canceled.

Claim 8 is canceled.

Claim 9 is canceled.

Claim 10 is canceled.

Claim 11 is canceled.

Claim 12 is canceled.

Claim 13 is rejected.

Claim 14 is rejected.

Claim 15 canceled.

Claim 16 is rejected.

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IV. STATUS OF AMENDMENTS

No amendments have been filed subsequent to the Final Office Action mailed April 6, 2007.

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V. SUMMARY OF CLAIMED SUBJECT MATTER

Independent Claim 1

Independent claim 1 is directed to a memory storage device 40, Fig. 3, having an operating system (the application specification ("Specification") page 4, lines 9-15), which uses at least one inode 63, 64, Fig. 5, for accessing file segments (Specification page 5, lines 5-10). The inode includes a plurality of rows, a portion of the rows storing extents 65-66, Fig. 5, pointing to data blocks 80-82, 84-85, 92-94, Fig. 5 (Specification page 5, lines 9-10), each extent having a field "FLAG", Fig. 6A-6B, to indicate whether the extent is an indirect extent, a hole extent or a direct extent. Specification page 6, lines 22-23 points out that a portion of the flag field categorizes the data type stored in a data block into one of three types: real file data, non-data, or extents.

Specification page 6, line 24 – page 7, line 1 points out that, if a data block 100, Fig. 7, has real data for the associated file, ... the flag field indicates that the associated extent 101 is a direct extent; if the data block 102 is not yet allocated, ... the flag field indicates that the associated extent 103 is a hole extent; and if the data block 105 stores more extents, ... the flag field indicates that the associated extent 106 is an indirect extent.

Independent Claim 5

Independent claim 5 is directed to an automated method of storing data files in a memory storage system, including assigning an inode 63, 64, Fig. 5, to a data file to be stored (Specification page 5, lines 5-10). The method further includes writing a plurality of extents 65-

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66, Fig. 5, in the inode, each extent pointing to a string of one or more data blocks 80-82, 84-85, 92-94, Fig. 5 (Specification page 5, lines 9-10), for storing a segment of the data file and having a field "FLAG", Fig. 6A-6B, for indicating that the extent is one of an indirect extent, a hole extent, and a direct extent. Specification page 6, lines 22-23 points out that a portion of the flag field categorizes the data type stored in a data block into one of three types: real file data, non-data, or extents.

Specification page 6, line 24 – page 7, line 1 points out that, if a data block 100, Fig. 7, has real data for the associated file, ... the flag field indicates that the associated extent 101 is a direct extent; if the data block 102 is not yet allocated, ... the flag field indicates that the associated extent 103 is a hole extent; and if the data block 105 stores more extents, ... the flag field indicates that the associated extent 106 is an indirect extent.

Independent Claim 13

Independent claim 13 is directed to a distributed storage system including a global cache memory 42, Fig. 3; a plurality of processors 44, 45, Fig. 3, coupled to the global cache memory 42, each processor having a local memory for storing an operating system (Specification page 4, lines 10-14). The system further includes a plurality of data storage devices 47-49, Fig. 3, coupled to the global cache memory 42, the devices 47-49 and processors 44, 45 capable of communicating by posting messages to each other in the cache memory (Specification page 4, lines 16-24). Each of the devices 47-49 having a processor and local memory storing an operating system (Specification page 4, lines 10-14), each operating system including an extent based file system for abstracting file names to physical data blocks in the storage devices

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(Specification page 4, line 25 – page 5, line 10). Each extent includes a field to indicate whether the extent is an indirect extent, a hole extent or a direct extent. Specification page 6, lines 22-23 points out that a portion of the flag field categorizes the data type stored in a data block into one of three types: real file data, non-data, or extents.

Specification page 6, line 24 – page 7, line 1 points out that, if a data block 100, Fig. 7, has real data for the associated file, ... the flag field indicates that the associated extent 101 is a direct extent; if the data block 102 is not yet allocated, ... the flag field indicates that the associated extent 103 is a hole extent; and if the data block 105 stores more extents, ... the flag field indicates that the associated extent 106 is an indirect extent.

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VI. GROUND OF REJECTION TO BE REVIEWED ON APPEAL

Whether claims 1, 2, 4-6, 13, 14 and 16 are unpatentable under 35 U.S.C. §103(a) over the Background of the Invention of the Application Specification ("Background") in view of Soltis (U.S. Patent Application Publication No. 2004/0133570).

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VII. ARGUMENT

REJECTION UNDER 35 U.S.C. §103(a) OVER THE BACKGROUND IN VIEW OF SOLTIS

Claims 1, 2 and 4

Independent claim 1 was rejected under 35 U.S.C. § 103(a) as being unpatentable over the Background and Fig. 1 in view of Soltis (U.S. Patent Application Publication No. 2004/0133570). The examiner states that, while the Background does not teach that each extent in the memory storage device includes a field to indicate whether the extent is an indirect extent, a hole extent, or a direct extent, Soltis teaches extents having a flag for the purpose of determining whether or not the extent addresses real data or a hole in the file. The examiner admits that the Background does not teach an extent having a field to indicate whether the extent is an indirect extent, a hole extent, or a direct extent, and relies on the teaching of Soltis to support the conclusion that it would have been obvious to combine the teachings of the Background and Soltis to utilize the use of the field or flag to indicate the type of an extent.

This rejection is appealed because the combination suggested by the examiner is improper since Soltis teaches away from the combination and because the combination does not teach or suggest the invention recited in independent claim 1.

Independent claim 1 recites, in addition to other features, that "a portion of the rows storing extents point[s] to data blocks, each extent having a field to indicate whether the extent is an indirect extent, a hole extent, or a direct extent." The examiner admits that the Background does not teach an extent having a field to indicate whether the extent is an indirect extent, a hole

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extent, or a direct extent, so Soltis must teach the feature in order for independent claim 1 to be unpatentable over the combination relied upon by the examiner.

The applicants respectfully assert that Soltis does not teach or suggest the “field to indicate whether the extent is an indirect extent, a hole extent, or a direct extent.” The extents in the Soltis system include a flag that determines whether or not the extent addresses either real data or a hole in the file (Section [0079], last sentence). However, there is no teaching or suggestion of a flag or field in the Soltis extent to indicate whether the extent is an *indirect extent*, a hole extent, or a direct extent. In fact, Soltis specifically teaches that the field in his extent is capable of identifying *exactly two* types of extents: a valid data extent and a hole extent. See Table 1, page 9, under “Inode File.” This Table indicates that the flag is capable of indicating whether an extent is invalid, in which case the process terminates with an error (Paragraph [0104], lines 4-6); and whether the extent points to valid data or a hole. There is no teaching or suggestion in Soltis of the desirability of making his extent capable of indicating whether the extent is an *indirect extent*, a hole extent, or a direct extent.

The examiner also cited Sections [0126-0127] to support the rejection. Applicant asserts that, in these paragraphs, Soltis *teaches away* from the combination suggested by the examiner. While, in Paragraph [0126] Soltis mentions using extents to address data blocks that contain direct extents, in Paragraph [0127], he states that such additional indirection “requires extra data transfers”, which, as is known in the art, is undesirable. Even though Soltis then states that a combination of both approaches “could satisfy extreme cases,” he never teaches how such a “combination” would be configured or why it would be desirable. Soltis also does not teach or

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suggest the desirability of a field in an extent that is capable of indicating whether the extent is an *indirect extent*, a hole extent, or a direct extent.

Regardless of the fact that Soltis admits that, in his system, indirection would require additional data transfers, the fact remains that, even if the direct extents in the Soltis system could point to further extents, there is no mechanism taught or suggested by Soltis that indicates whether the extent is an *indirect extent*, a hole extent, or a direct extent.

The examiner also cited claim 50 as including a reference to an "indirect extent pointer." However, it is clear that there is no support in Soltis' specification for an "indirect extent pointer." In fact, in the patent that issued from the Soltis published application, (U.S. Patent No. 6,697,846), claim 50 and the language recited in claim 50 is absent from the patent, and claim 31, the only other claim that recited an "indirect" pointer in the published application, was amended to delete any recitation of "indirect."

Applicants therefore respectfully assert that the only teaching of a field in an extent that indicates whether an extent is an indirect extent, a hole extent, or a direct extent is in the applicants' Specification and that there is no teaching or suggestion in Soltis of the desirability of such a field.

Accordingly, because Soltis teaches away from the combination suggested by the examiner and because the combination of the Background and Soltis does not teach the invention recited in independent claim 1, applicants respectfully assert that independent claim 1 is allowable over the combination and the rejection of independent claim 1 under 35 U.S.C. §103(a) is improper and should be withdrawn.

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Claims 2 and 4 depend from independent claim 1 and are allowable for at least the same reasons as independent claim 1.

Claims 5 and 6

Independent claim 5 was rejected under 35 U.S.C. § 103(a) as being unpatentable over the Background and Fig. 1 in view of Soltis (U.S. Patent Application Publication No. 2004/0133570). The examiner stated that, while the Background does not teach that each extent in the memory storage device includes a field to indicate whether the extent is an indirect extent, a hole extent, or a direct extent, Soltis teaches extents having a flag for the purpose of determining whether or not the extent addresses real data or a hole in the file. The examiner admits that the Background does not teach an extent having a field to indicate whether the extent is an indirect extent, a hole extent, or a direct extent, and relies on the teaching of Soltis to support the conclusion that it would have been obvious to combine the teachings of the Background and Soltis to utilize the use of the field or flag to indicate the type of an extent.

This rejection is appealed because the combination suggested by the examiner is improper since Soltis teaches away from the combination and because the combination does not teach or suggest the invention recited in independent claim 5.

Independent claim 5 recites, in addition to other features, that "each extent having a field for indicating that the extent is one of an indirect extent, a hole extent, and a direct extent." The examiner admits that the Background does not teach an extent having a field to indicate that the extent is one of an indirect extent, a hole extent, and a direct extent, so Soltis must teach the

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feature in order for independent claim 5 to be unpatentable over the combination relied upon by the examiner.

The applicants respectfully assert that Soltis does not teach or suggest the “field to indicate that the extent is one of an *indirect extent*, a hole extent, and a direct extent.” The extents in the Soltis system include a flag that determines whether or not the extent addresses either real data or a hole in the file (Section [0079], last sentence). However, there is no teaching or suggestion of a flag or field in the Soltis extent to indicate that the extent is one of an *indirect extent*, a hole extent, and a direct extent. In fact, Soltis specifically teaches that the field in his extent is capable of identifying *exactly two* types of extents: a valid data extent and a hole extent. See Table 1, page 9, under “Inode File.” This Table indicates that the flag is capable of indicating whether an extent is invalid, in which case the process terminates with an error (Paragraph [0104], lines 4-6); and whether the extent points to valid data or a hole. There is no teaching or suggestion in Soltis of the desirability of making his extent capable of indicating that the extent is one of an *indirect extent*, a hole extent, and a direct extent.

The examiner also cited Sections [0126-0127] to support the rejection. Applicant asserts that, in these paragraphs, Soltis *teaches away* from the combination suggested by the examiner. While, in Paragraph [0126] Soltis mentions using extents to address data blocks that contain direct extents, in Paragraph [0127], he states that such additional indirection “requires extra data transfers”, which, as is known in the art, is undesirable. Even though Soltis then states that a combination of both approaches “could satisfy extreme cases,” he never teaches how such a “combination” would be configured or why it would be desirable. Soltis also does not teach or

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suggest the desirability of a field in an extent that is capable of indicating that the extent is one of an *indirect extent*, a hole extent, and a direct extent.

Regardless of the fact that Soltis admits that, in his system, indirection would require additional data transfers, the fact remains that, even if the direct extents in the Soltis system could point to further extents, there is no mechanism taught or suggested by Soltis that indicates that the extent is one of an *indirect extent*, a hole extent, and a direct extent.

The examiner also cited claim 50 as including a reference to an "indirect extent pointer." However, it is clear that there is no support in Soltis' specification for an "indirect extent pointer." In fact, in the patent that issued from the Soltis published application, (U.S. Patent No. 6,697,846), claim 50 and the language recited in claim 50 is absent from the patent, and claim 31, the only other claim that recited an "indirect" pointer in the published application, was amended to delete any recitation of the term "indirect."

Applicants therefore respectfully assert that the only teaching of a field in an extent that indicates that the extent is one of an *indirect extent*, a hole extent, and a direct extent is in the applicants' Specification and that there is no teaching or suggestion in Soltis of the desirability of such a field.

Accordingly, because Soltis teaches away from the combination suggested by the examiner and because the combination of the Background and Soltis does not teach the invention recited in independent claim 5, applicants respectfully assert that independent claim 5 is allowable over the combination and the rejection of independent claim 5 under 35 U.S.C. §103(a) is improper and should be withdrawn.

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Claim 6 depends from independent claim 5 and is allowable for at least the same reasons as independent claim 5.

Claims 13, 14 and 16

Independent claim 13 was rejected under 35 U.S.C. § 103(a) as being unpatentable over the Background and Fig. 1 in view of Soltis (U.S. Patent Application Publication No. 2004/0133570). The examiner states that, while the Background does not teach that each extent in the memory storage device includes a field to indicate whether the extent is an indirect extent, a hole extent, or a direct extent, Soltis teaches extents having a flag for the purpose of determining whether or not the extent addresses real data or a hole in the file. The examiner admits that the Background does not teach an extent having a field to indicate whether the extent is an indirect extent, a hole extent, or a direct extent, and relies on the teaching of Soltis to support the conclusion that it would have been obvious to combine the teachings of the Background and Soltis to utilize the use of the field or flag to indicate the type of an extent.

This rejection is appealed because the combination suggested by the examiner is improper since Soltis teaches away from the combination and because the combination does not teach or suggest the invention recited in independent claim 13.

Independent Claim 13 recites, in addition to other features, that "each extent includes a field to indicate whether the extent is an indirect extent, a hole extent, or a direct extent." The examiner admits that the Background does not teach an extent having a field to indicate whether the extent is an indirect extent, a hole extent, or a direct extent, so Soltis must teach the feature in

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order for independent claim 13 to be unpatentable over the combination relied upon by the examiner.

The applicants respectfully assert that Soltis does not teach or suggest the “field to indicate whether the extent is an indirect extent, a hole extent, or a direct extent.” The extents in the Soltis system include a flag that determines whether or not the extent addresses either real data or a hole in the file (Section [0079], last sentence). However, there is no teaching or suggestion of a flag or field in the Soltis extent to indicate whether the extent is an *indirect extent*, a hole extent, or a direct extent. In fact, Soltis specifically teaches that the field in his extent is capable of identifying *exactly two* types of extents: a valid data extent and a hole extent. See Table 1, page 9, under “Inode File.” This Table indicates that the flag is capable of indicating whether an extent is invalid, in which case the process terminates with an error (Paragraph [0104], lines 4-6); and whether the extent points to valid data or a hole. There is no teaching or suggestion in Soltis of the desirability of making his extent capable of indicating whether the extent is an *indirect extent*, a hole extent, or a direct extent.

The examiner also cited Sections [0126-0127] to support the rejection. Applicant asserts that, in these paragraphs, Soltis *teaches away* from the combination suggested by the examiner. While, in Paragraph [0126] Soltis mentions using extents to address data blocks that contain direct extents, in Paragraph [0127], he states that such additional indirection “requires extra data transfers”, which, as is known in the art, is undesirable. Even though Soltis then states that a combination of both approaches “could satisfy extreme cases,” he never teaches how such a “combination” would be configured or why it would be desirable. Soltis also does not teach or

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suggest the desirability of a field in an extent that is capable of indicating whether the extent is an *indirect extent*, a hole extent, or a direct extent.

Regardless of the fact that Soltis admits that, in his system, indirection would require additional data transfers, the fact remains that, even if the direct extents in the Soltis system could point to further extents, there is no mechanism taught or suggested by Soltis that indicates whether the extent is an *indirect extent*, a hole extent, or a direct extent.

The examiner also cited claim 50 as including a reference to an "indirect extent pointer." However, it is clear that there is no support in Soltis' specification for an "indirect extent pointer." In fact, in the patent that issued from the Soltis published application, (U.S. Patent No. 6,697,846), claim 50 and the language recited in claim 50 is absent from the patent, and claim 31, the only other claim that recited an "indirect" pointer in the published application, was amended to delete any recitation of "indirect."

Applicants therefore respectfully assert that the only teaching of a field in an extent that indicates whether an extent is an indirect extent, a hole extent, or a direct extent is in the applicants' Specification and that there is no teaching or suggestion in Soltis of the desirability of such a field.

Accordingly, because Soltis teaches away from the combination suggested by the examiner and because the combination of the Background and Soltis does not teach the invention recited in independent claim 13, applicants respectfully assert that independent claim 13 is allowable over the combination and the rejection of independent claim 13 under 35 U.S.C. §103(a) is improper and should be withdrawn.

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Claims 14 and 16 depend from independent claim 13 and are allowable for at least the same reasons as independent claim 13.

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VIII. CLAIMS APPENDIX

1. A memory storage device having an operating system which uses at least one inode for accessing file segments, the inode comprising:

a plurality of rows; and

a portion of the rows storing extents pointing to data blocks, each extent having a field to indicate whether the extent is an indirect extent, a hole extent or a direct extent.
2. The memory storage device of claim 1, wherein each inode is adapted to allow any portion of the extents stored therein to be indirect extents.
4. The memory device of claim 1, wherein each extent further comprises a length field, the length field of each indirect extent indicating the number of data blocks pointed to indirectly by the indirect extent.
5. An automated method of storing data files in a memory storage system, comprising:

assigning an inode to a data file to be stored; and

writing a plurality of extents in the inode, each extent pointing to a string of one or more data blocks for storing a segment of the data file and having a field for indicating that the extent is one of an indirect extent, a hole extent, and a direct extent.

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6. The method of claim 5, further comprising:

replacing each of a plurality of the direct extents by at least one indirect extent pointing to a data block; and

writing to each data block pointed to by one of the indirect extents the direct extent that is replaced by the one of the indirect extents.

13. A distributed storage system, comprising:

a global cache memory;

a plurality of processors coupled to the global cache memory, each processor having a local memory for storing an operating system; and

a plurality of data storage devices coupled to the global cache memory, the devices and processors capable of communicating by posting messages to each other in the cache memory, each of the devices having a processor and local memory storing an operating system, each operating system including an extent based file system for abstracting file names to physical data blocks in the storage devices, wherein each extent includes a field to indicate whether the extent is an indirect extent, a hole extent or a direct extent.

14. The system of claim 13, wherein each operating system is adapted to map files to data blocks by assigning an inode to a file, each inode capable of storing a plurality of extents.

16. The system of claim 13, each operating system being a UNIX based system.

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IX. EVIDENCE APPENDIX

A. Applicants "Background of the Invention" section, pages 1-2, of the subject patent application, entitled Versatile Indirection in an Extent Based File System, filed on August 20, 2003, Application Serial No. 10/644,458. (Copy not enclosed)

B. U.S. Patent Application Publication No. 2004/0133570 to Soltis, entitled Shared File System.

Cited by the examiner in the Office Action dated October 13, 2006.

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X. RELATED PROCEEDINGS APPENDIX

None

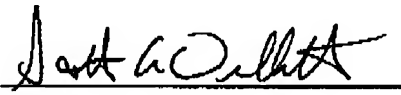
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XI. CONCLUSION

For the reasons set forth above, applicants respectfully assert that the combination of references relied upon by the examiner is improper and does not teach the invention recited in the claims. Therefore, applicants assert that claims 1, 2, 4-6, 13, 14 and 16 are allowable over the art of record. Accordingly, applicants respectfully request withdrawal of the obviousness rejection of claims 1, 2, 4-6, 13, 14 and 16 over the Background in view of Soltis and the allowance of claims 1, 2, 4-6, 13, 14 and 16.

Respectfully submitted,

1/7/08
Date



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